METHOD OF MEASURING DISHING

Jaime Poris

ABSTRACT

A metrology process, in accordance with the present invention, measures the dishing of an opaque feature with respect to a relatively transparent feature that surrounds the opaque feature on a production substrate by measuring only height variation of the opaque feature. The opaque feature may be, for example, a metal or metal alloy line containing, e.g., copper, aluminum, or tungsten, while the relatively transparent feature is a dielectric material. The metrology process is useful, for example, after the metal and dielectric materials undergo a polishing process, e.g., CMP, to approximately planarize the surface. The method includes generating a set of calibration data or curves that correlate the magnitude of dishing with the width of a metal line and the profile, shape, or height variation of the metal line. In addition, different sets of calibration data may be generated based on different parameters used in the polishing process. The height variation of the metal line is measured using, e.g., a differential interferometer or a laser displacement sensor. The height variation may be described using a set of data, a curve, an average radius of curvature or a more complicated mathematical description. The height variation is then correlated with the calibration data to determine the magnitude of dishing as well as the amount of dielectric erosion.